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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/766,739	01/29/2004	Kazuhide Abe	OKI.612	2843

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EXAMINER	
INGHAM, JOHN C	

ART UNIT	PAPER NUMBER
2814	

DATE MAILED: 07/20/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/766,739	ABE, KAZUHIDE	
	Examiner	Art Unit	
	John C. Ingham	2814	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *09 June 2006*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-32* is/are pending in the application.

4a) Of the above claim(s) *17-24* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-16 and 26-32* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *29 January 2004* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *1/29/04*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

1. Applicant's election of claims 1-16 and 26-32, filed 9 June 2006 without traverse, has been entered.

Claim Rejections - 35 USC § 102

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

3. Claims **1 and 8** are rejected under 35 U.S.C. 102(b) as being anticipated by Ngo (US 6,329,701).

4. Regarding claim **1**, Ngo discloses in Fig 5 a wiring structure of a semiconductor device, comprising: a first insulating film (20) having plural grooves (21) formed thereon, which has an interface (30) in the horizontal direction between the adjoining grooves; plural wiring films (23) formed to protrude from the interface, each by the grooves of the first insulating film; plural barrier films (22), formed on bottoms of the wiring films, which are formed on side faces of the wiring films to a height exceeding the interface; and

plural cap films (50) formed at least on upper faces of the wiring films, which are separated by the grooves.

5. Regarding claim **8**, Ngo discloses in Fig 5 the device of claim 1, wherein the cap films (50) are formed selectively on parts of the wiring films and the barrier films (23 and 22), protruding from the interface (30).

6. Claims **1-2, and 5-9** are rejected under 35 U.S.C. 102(e) as being anticipated by Geffken (US 6,680,514).

7. Regarding claim **1**, Geffken discloses in Fig 6 a wiring structure of a semiconductor device, comprising: a first insulating film (49) having plural grooves (72, 73) formed thereon, which has an interface (top surface of 49) in the horizontal direction between the adjoining grooves; plural wiring films (62, 63) formed to protrude from the interface, each by the grooves of the first insulating film; plural barrier films (66, 67), formed on bottoms of the wiring films, which are formed on side faces of the wiring films to a height exceeding the interface; and plural cap films (78, 79) formed at least on upper faces of the wiring films, which are separated by the grooves.

8. Regarding claim **2**, Geffken discloses in Fig 6 the device of claim 1, wherein the cap films (78, 79) are formed on parts protruding from the interface from the upper faces of the wiring films till the interface of the first insulating film, and are separated on the interface (gap shown between 78 and 79).

9. Regarding claims **5-7 and 9**, Geffken discloses in Fig 6 the device of claim 2 wherein the cap films are a metal film of tantalum, titanium nitride, or tungsten nitride (col 7 ln 20-22).

10. Regarding claim **8**, Geffken discloses in Fig 6 the device of claim 1, wherein the cap films (78, 79) are formed selectively on parts of the wiring films and the barrier films (62, 63), protruding from the interface (top of 49).

Claim Rejections - 35 USC § 103

11. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

12. Claims **1-16 and 26-32** are rejected under 35 U.S.C. 103(a) as being unpatentable over Lim (US 6,380,084) and Geffken.

13. Regarding claim **1**, Lim discloses in Fig 14 a wiring structure of a semiconductor device, comprising: a first insulating film (72) having plural grooves (Fig 11, one shown in a hillock) formed thereon, which has an interface (top surface of 72 around hillock) in the horizontal direction between the adjoining grooves; plural wiring films (84) formed to protrude from the interface, each by the grooves of the first insulating film; plural barrier films (56, 80), formed on bottoms of the wiring films, which are formed on side faces of the wiring films to a height exceeding the interface. Lim fails to specify that the wiring

structure includes plural cap films formed at least on upper faces of the wiring films, which are separated by the grooves.

Geffken teaches the use of metal film cap layers in Fig 6 (item 79), which serve as a local interconnect wire for conductively coupling plural interconnects. It would have been obvious to form cap films on the upper faces of the wiring films in order to conductively connect separate wirings.

14. Regarding claim **2**, Geffken discloses in Fig 6 the device of claim 1, wherein the cap films (78, 79) are formed on parts protruding from the interface from the upper faces of the wiring films till the interface of the first insulating film, and are separated on the interface (gap shown between 78 and 79).

15. Regarding claim **3**, Lim discloses in Fig 14 the device of claim 2, wherein the cap films taught by Geffken will be formed only on the upper faces of the wiring films (84) and the barrier films (80).

16. Regarding claim **4**, Geffken discloses in Fig 7 the device of claim 2, wherein the cap films (84) can be an insulating film containing silicon nitride or silicon carbide (col 8 ln 43-44).

17. Regarding claims **5-7 and 9**, Geffken discloses in Fig 6 the device of claim 2 wherein the cap films are a metal film of tantalum, titanium nitride, or tungsten nitride (col 7 ln 20-22).

18. Regarding claim **8**, Geffken discloses in Fig 6 the device of claim 1, wherein the cap films (78, 79) are formed selectively on parts of the wiring films and the barrier films (62, 63), protruding from the interface (top of 49).

19. Regarding claims **10-11**, Lim discloses in Fig 14 the device of claim 1 wherein the first insulating film (72) has plural protrusions (hillock shown) protruding from the interface (surface of 72 around hillock), the grooves are formed in the protrusions, and upper faces of the wiring films (84) and the barrier films (80) are substantially coincident with upper ends of the grooves.

20. Regarding claim **12**, Geffken discloses in Fig 6 the device of claim 11 wherein the upper faces of the cap films (79) have the same shape as the upper faces of the protrusions (Lim Fig 14). The language "wherein the protrusions are formed through etching the first insulating film using the cap films as a mask" describes a product by process. Product by process claims are not limited to the steps recited, but to the structure resulting from the steps. The device taught by Geffken and Lim satisfies the structural limitations of the claim.

21. Regarding claims **13-15**, Geffken discloses in Fig 6 the device of claim 12 wherein the cap films are a metal film of tantalum, titanium nitride, or tungsten nitride (col 7 ln 20-22).

22. Regarding claim **16**, Geffken discloses in Fig 7 the device of claim 12, wherein the cap films (84) can be an insulating film containing silicon nitride or silicon carbide (col 8 ln 43-44).

23. Regarding claim **26**, Lim discloses in Fig 14 a wiring structure of a semiconductor device, comprising: a first insulating film (72) having plural protrusions (hillock shown) in which grooves (Fig 11, one shown in a hillock) formed, which has an interface (top surface of 72 around hillock) in the horizontal direction between the adjoining

protrusions; plural wiring films (84) embedded in the grooves through barrier films (56, 80). Geffken teaches the use of first metal film cap layers in Fig 6 (item 79) formed on upper faces of the protrusions; and second cap films (Fig 7 item 84) formed on the first cap films and the first insulating film.

24. Regarding claim **27**, Lim discloses in Fig 14 the device of claim 26 wherein the upper faces of the wiring films (84) and the barrier films (80) are substantially coincident with upper ends of the grooves.

25. Regarding claim **28**, Geffken discloses in Fig 6 the device of claim 26 wherein the upper faces of the cap films (79) have the same shape as the upper faces of the protrusions (Lim Fig 14). The language "wherein the protrusions are formed through etching the first insulating film using the cap films as a mask" describes a product by process. Product by process claims are not limited to the steps recited, but to the structure resulting from the steps. The device taught by Geffken and Lim satisfies the structural limitations of the claim.

26. Regarding claims **29-31**, Geffken discloses in Fig 6 the device of claim 28 wherein the first cap films are a metal film of tantalum, titanium nitride, or tungsten nitride (col 7 ln 20-22).

27. Regarding claim **32**, Geffken discloses in Fig 7 the device of claim 28, wherein the second cap films (84) can be an insulating film containing silicon nitride or silicon carbide (col 8 ln 43-44).

Double Patenting

28. The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. A nonstatutory obviousness-type double patenting rejection is appropriate where the conflicting claims are not identical, but at least one examined application claim is not patentably distinct from the reference claim(s) because the examined application claim is either anticipated by, or would have been obvious over, the reference claim(s). See, e.g., *In re Berg*, 140 F.3d 1428, 46 USPQ2d 1226 (Fed. Cir. 1998); *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) or 1.321(d) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent either is shown to be commonly owned with this application, or claims an invention made as a result of activities undertaken within the scope of a joint research agreement.

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

29. Claims **1, 2, 5-8, and 9** are rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 1, and 7-12 of U.S. Patent No. 6,969,911. Although the conflicting claims are not identical, they are not patentably distinct from each other because claim 1 of the '911 patent recites a first insulating film having plural grooves, plural wiring films, plural barrier films, and plural metal cap films of double layers formed on parts (upper and sides) of the wiring. Claims 7 and 8 recite that the second cap film is formed separately for each of the grooves and only on the sides of the barrier film and first cap film (separated on the interface). Claims 9-12 recite that the cap film comprises SiN, TaN, TiN, or WN.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to John C. Ingham whose telephone number is (571) 272-8793. The examiner can normally be reached on M-F, 8am-5pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Wael Fahmy can be reached on (571) 272-1705. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

John C Ingham
Examiner
Art Unit 2814

jci

HOWARD WEISS
PRIMARY EXAMINER